

## Is Corneal Sensitivity Sex Dependent?

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## Abstract

**Purpose:** To determine whether corneal sensitivity is different between the two genders.**Methods:** Corneal sensitivity of 130 normal volunteers, including 77 women and 53 men aged 20-35 years, with no history of previous ocular surgery was measured using the Cochet-Bonnet esthesiometer. Measurements were done on five corneal regions: central, nasal, inferior, temporal and superior. The findings were compared between men and women using the non-parametric Mann-Whitney U test.**Results:** Mean age of male subjects was 28.0 years and that of female participants was 26.8 years ( $P = 0.063$ ). There was a significant difference in corneal sensitivity between men and women in the superior ( $P = 0.013$ ), temporal ( $P = 0.020$ ) and inferior ( $P = 0.046$ ) regions. There was no significant difference in corneal sensitivity in the central ( $P = 0.862$ ) and nasal ( $P = 0.273$ ) regions.**Conclusion:** Except for the central and nasal regions, corneal sensitivity is significantly higher in men as compared to women. The reason for this difference is not yet evident.**Keywords:** Corneal Sensitivity; Esthesiometry; Sex*J Ophthalmic Vis Res* 2015; 10 (2): 102-105.

## INTRODUCTION

There are several physiological differences between men and women, such as structural and hormonal differences. Differences also exist in the eyes. An example of such a difference is the higher incidence of myopia in women, as compared to men.<sup>[1]</sup> One of the physiological characteristics of the human eye is corneal sensitivity, which is clinically important in monitoring corneal diseases and also for confirmation of corneal health.

Corneal sensitivity is a function of the ophthalmic branch of the trigeminal nerve. Nerve bundles penetrate

the cornea in a radial fashion parallel to the corneal surface forming a terminal subepithelial plexus. The nerve bundles lose their myelin sheaths, enter the Bowman layer and terminate at the wing cell level of the epithelium.<sup>[2]</sup> There are two methods of corneal sensitivity measurement, i.e., contact and non-contact methods. The contact method is performed using the Cochet-Bonnet esthesiometer, which stimulates the mechano-nociceptors and polymodal nociceptors, and measures tactile sensitivity.<sup>[3]</sup> Non-contact methods stimulate cold-sensitive receptors, polymodal and mechano-nociceptors.<sup>[4-6]</sup> Non-contact methods are expensive and non-portable. The contact method is more widely used compared to the non-contact method. Physiologically, corneal sensitivity varies with corneal location, time of the day, age and the use of contact lenses.<sup>[7]</sup>

The issue of gender differences in corneal sensitivity has been much disputed in the field of neuro-ophthalmology.

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Received: 28-10-2013 Accepted: 15-06-2014

## Access this article online

Quick Response Code:



Website:  
www.jovr.org

DOI:  
10.4103/2008-322X.163772

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**How to cite this article:** Khezri F, Mirzajani A, Karimian F, Jafarzadehpur E. Is corneal sensitivity sex dependent?. *J Ophthalmic Vis Res* 2015;10:102-5.

In a number of previous studies,<sup>[7-9]</sup> no difference was found between the genders; however, in Golebiowski's study,<sup>[10]</sup> men showed higher thresholds, i.e., less corneal sensitivity, than women. The aim of this study was to measure and compare corneal sensitivity between men and women.

## METHODS

In this cross-sectional study, corneal sensitivity was measured in 130 volunteers (aged 20-35 years) including 77 women and 53 men. The subjects were selected from those referred to an optometry clinic. All subjects had normal corneas, with no systemic and ocular pathology or previous ocular surgery that may alter corneal sensitivity and there was no history contact lens use.

The study protocol and methods were approved by the Ethics Committee of Iran University of Medical Sciences prior to the study, and adhered to the tenets of the Declaration of Helsinki. The procedure adopted for measurement of corneal sensitivity was explained to all participants and written informed consent was obtained prior to the examination. Corneal sensitivity was measured using the Cochet-Bonnet esthesiometer (Luneau Ophthalmology, Paris, France). The instrument consists of a nylon monofilament with variable length of 60-5 mm. As the length of the monofilament is decreased, the pressure transmitted to the cornea is increased.

The cornea was divided into five regions: central, nasal, inferior, temporal and superior; and evaluation was performed in corresponding areas. In all subjects, non-central areas were measured 2 mm away from the corneal center. To measure corneal sensitivity, the participants were instructed to sit and look straight ahead. The esthesiometer was moved slowly with the maximum length of 60 mm toward the eye, until the first touch with the cornea was visible. Because of a slight bend in the monofilament and in order to make a perpendicular approach, the body of the instrument was positioned slightly downward. If the person could sense the touch, this length of the monofilament was recorded as corneal sensitivity and if not; the length of the monofilament was reduced in 5 mm increments until he/she reported the touch. At each corneal location, three measurements were performed and their average was considered as corneal sensitivity in the tested corneal region. Ethanol (70%) was used to disinfect the monofilament of the esthesiometer between subjects. All measurements were performed by the same examiner at 18°C, 35% humidity, between 2-5 PM to avoid diurnal variation.<sup>[11]</sup>

Data analysis was performed using SPSS Software version 16 (SPSS Corporation, Chicago, IL, USA). Given that the data obtained using the Cochet-Bonnet esthesiometer are not continuous, the Mann-Whitney

U test was used to compare differences between men and women. *P* values < 0.05 were considered statistically significant.

## RESULTS

Only the right eyes of 130 subjects aged 20-35 (mean age, 27.2) years were examined and their data was analyzed. Mean age of the male group was 28.0 years while that of the female group was 26.8 years. The age difference between male and female participants was not statistically (*P* = 0.063) or clinically significant.

The Mann-Whitney U test was conducted to determine whether there was a difference in corneal sensitivity of men versus women. Results of the analysis indicated that in the superior (*P* = 0.013), temporal (*P* = 0.020) and inferior (*P* = 0.046) cornea, sensitivity was significantly higher in men. There was no statistically significant difference in corneal sensitivity between the genders in the central (*P* = 0.862) and nasal (*P* = 0.273) corneal regions.

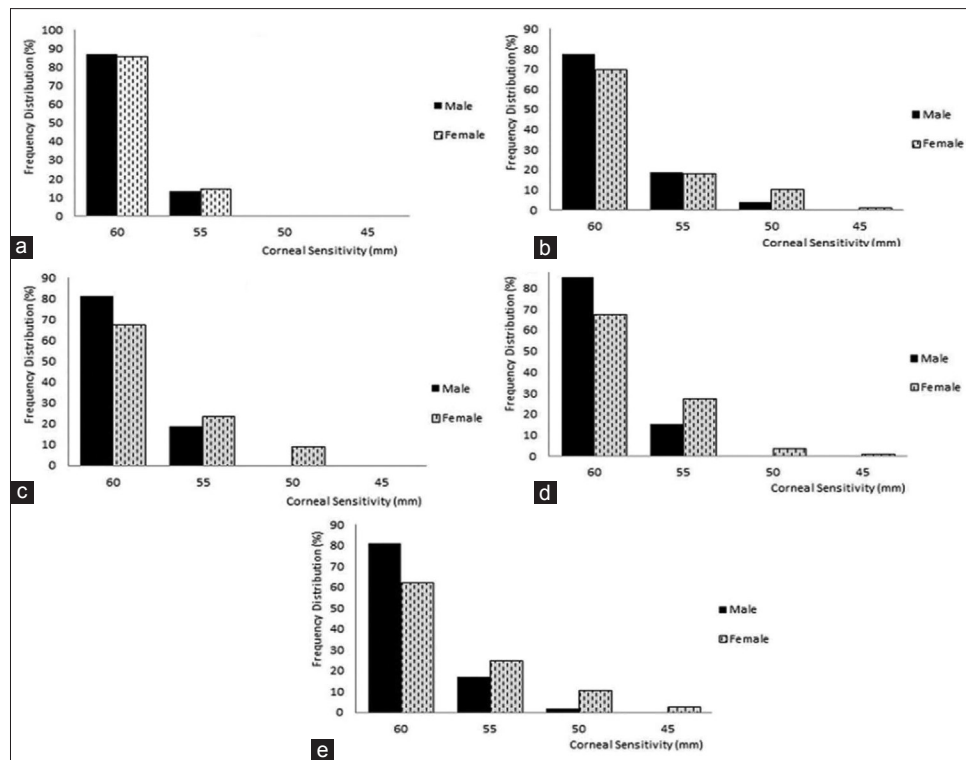
The frequency distributions of corneal sensitivities of 60, 55, 50 and 45 mm for men and women are shown and compared in Figure 1. The frequency of corneal sensitivity of 60 mm in all corneal regions (central, nasal, inferior, temporal and superior) was higher in men than women. Generally in all corneal regions the frequency of corneal sensitivities shifted towards lower values in women.

## DISCUSSION

The aim of the present study was to determine whether any difference exists in corneal sensitivity between men and women. Except for the central and nasal regions of the cornea, in the other three peripheral regions, men demonstrated more sensitive corneas than women and it seems that this finding has not reported previously.

Millodot<sup>[7]</sup> and Roszkowska et al,<sup>[9]</sup> using the contact Cochet-Bonnet esthesiometer, did not find a significant difference in corneal sensitivity between men and women. Henderson et al<sup>[8]</sup> also found the same result using a non-contact corneal esthesiometer. On the other hand, Golebiowski et al<sup>[10]</sup> and Acosta et al<sup>[12]</sup> using non-contact corneal esthesiometry reported that corneal sensitivity in women is higher than men. Although not proven, they attributed this difference to hormonal changes. The differences in the results of the various studies cannot be attributed to discrepancies in the method of esthesiometry. Besides, it has been reported that the Cochet-Bonnet esthesiometer has high reproducibility,<sup>[13]</sup> reliability and repeatability<sup>[3]</sup> to assess corneal sensitivity.

A possible explanation for the difference between the results of this study and those which did not find any difference between men and women,<sup>[7-9]</sup> could be



**Figure 1.** Frequency distribution of corneal sensitivities of 60, 55, 50 and 45 mm in the corneal regions of (a) central, (b) nasal, (c) inferior, (d) temporal and (e) superior.

as a result of subject age. Previous studies examined subjects from all age groups whereas subjects in the current series were 20-35 years of age and there may be an interaction between age and gender in terms of corneal sensitivity. He<sup>[14]</sup> did not find any difference in central or peripheral epithelial nerve densities between genders; hence, corneal sensitivity difference between men and women cannot be attributed to a difference in corneal nerve densities.

In this study, the cornea was more sensitive in men compared to women which may be partly due to manipulation of the eyes. Female subjects were contacted and asked about eye makeup. In total, 81% of them used eye makeup (62 subjects out of 76). This may make their cornea less sensitive to a foreign body or touch of the esthesiometer's monofilament. Polse<sup>[15]</sup> in a study showed that sensory adaptation to the mechanical stimulation by contact lenses is responsible for corneal sensitivity reduction in contact lens wearers. This may support the hypothesis of the effect of frequent mechanical stimulation on corneal sensitivity. However, further research regarding the effect of eye manipulation, such as makeup in changing corneal sensitivity is recommended.

Based on findings of the present study, except for central and nasal regions, corneal sensitivity was significantly higher in men compared to women, in the other three tested areas, namely the superior, temporal and inferior regions. The reason for this difference can be the matter of further research.

## Acknowledgment

This study was part of an MSc. thesis supported by Iran University of Medical Sciences (grant No: P/4205). The authors extend their gratitude to all subjects who participated in this study.

## Financial Support and Sponsorship

Nil.

## Conflicts of Interest

There are no conflicts of interest.

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